# A COMPARISON OF THE RELATIVE HEALTHFUL-
# NESS OF CERTAIN CITIES IN THE UNITED
# STATES BASED UPON THE STUDY OF
# THEIR VITAL STATISTICS.

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In making a comparison of the relative healthfulness of several cities, the whole picture of the sanitary conditions must be obtained; in other words, the problem must not be approached from a single viewpoint. Take, for example, two communities, one having a high typhoid rate and a low infant mortality rate, the other having a low typhoid rate and a high infant mortality rate; if either the typhoid or the infant mortality rate is taken as the only criterion, are we able definitely and impartially to decide which of the two is the more healthful? Decidedly not, for we have approached the problem from one point of view and have omitted the measurement of other factors which go to make up the total health of a community. It is necessary, therefore, to make use of indices measuring as many as possible of the factors going to make up the total picture of the health of the community.

This, of course, is somewhat idealistic, and for practical purposes is not possible except perhaps by the use of life tables, which probably furnish the best single measurement of the health of a community. Many health factors are taken into account in the construction of a life table. This method of comparison has the drawback that life tables require a great deal of time and technical knowledge for their construction. In this paper, accordingly, the ideal method of comparing communities by the use of life tables will not be employed, but a few of what would appear to be the most valuable of the other indices will be considered.

The following cities will be considered: Baltimore, Boston, Buffalo, Cincinnati, Cleveland, Denver, Los Angeles, Minneapolis, New York, Omaha, Pittsburgh, San Francisco, and St.

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Louis.   A period of 15 years, 1900 to 1914, will be covered, for it seems to be advisable to include a sufficient number of years to avoid the fluctuations in the yearly rates due to other causes than actual health work.   Because of these little understood variations, it is hardly fair to judge a city by one year's experience.   It is the steady general tendency in health conditions resulting from organized purposeful health work which we wish to measure, and this can best be done by studying the vital statistics for a number of years.

For the first 13 years considered, the material has been obtained from the annual Mortality Statistics published by the Bureau of the Census.   The data used for obtaining the figures for the last two years were furnished me by the health officers of the various cities, or were obtained from the annual health reports of these cities.   In one or two instances certain figures for 1913 were obtained from the mortality statistics for that year instead of the annual reports of health officers.

In calculating rates, midyear estimates of the population were used.   Whenever it was found necessary to estimate the population, the arithmetical method was employed.   The estimates of population for 1910, 1911, 1912, and 1913 were taken from Bulletin 122 of the Bureau of the Census.   Of course these estimates for the last 4 years of the period under consideration may be too low or too high, but this cannot be determined until the next census is taken.   Thus the rates for the last 4 years may be slightly inaccurate; in some cases the rates will be too low and in others, where the population has grown more rapidly than has been estimated, the rates will be too high.   The probability is, however, that these errors are small and of but little consequence.   Then, too, the rates used are as likely to be correct as any that can now be obtained.   The calculations for this paper were made by the use of a slide rule, as this method was deemed to give sufficient accuracy.

*The Crude Death Rate* is frequently used as an index in judging the sanitary condition of a community.   It is not an altogether accurate index, for it is influenced by or depends upon a number of factors which do not come within the con-

trol of health authorities and which may vary a great deal
in two places. The age and sex distribution of the population
are two important factors which greatly influence the crude
death rate. As these factors have nothing to do with the
healthfulness of a given place, an index which is influenced
by them is not altogether satisfactory. The crude death
rates, however, give some general indications which may be
of value, and are probably a fairly accurate measure of the
changes over a period of years in a given community, for here
the factors of age and sex distribution do not vary much from
year to year.

The following table gives the average crude death rate
per 1,000 population for the entire period, the average rate
for the first three and the last three years of the period, and
the decrease or increase between these last average rates:

TABLE I.
CRUDE DEATH RATES FROM ALL CAUSES.

| City. | Average Rate, 1900–1914. | Average Rate, 1900–1902. | Average Rate, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore | 19.3 | 20.4 | 18.0 | −2.4 |
| Boston | 17.9 | 19.7 | 16.3 | −3.5 |
| Buffalo | 15.5 | 14.9 | 15.4 | +0.5 |
| Cincinnati | 18.7 | 18.6 | 16.5 | −2.1 |
| Cleveland | 14.5 | 16.0 | 13.6 | −2.4 |
| Denver | 16.6 | 18.5 | 13.7 | −4.8 |
| Los Angeles | 15.5 | 17.0 | 14.2 | −2.8 |
| Minneapolis | 10.8 | 11.0 | 11.3 | +0.3 |
| New Orleans | 21.9 | 23.6 | 20.2 | −3.4 |
| New York | 17.2 | 19.6 | 14.2 | −5.4 |
| Omaha | 12.8 | 12.0 | 13.4 | +1.4 |
| Pittsburgh | 18.3 | 19.9 | 16.2 | −3.7 |
| San Francisco | 17.7 | 20.7 | 15.6 | −5.1 |
| St. Louis | 16.3 | 17.8 | 15.0 | −2.8 |

It is evident from a study of this table that the rates in
nearly all the cities have decreased in the last 15 years. The
decrease is especially large in the case of New York, Denver,
and San Francisco. It will be observed that the rates have
increased for Buffalo, Minneapolis, and Omaha. In the case
of Buffalo, a city which is growing very rapidly, this is probably
due to the fact that the estimates of the population are too
low. The same reason may explain the increase in the rates
of the other two cities, or the increase may be due to imperfect
registration of deaths during the early part of the period being

considered, which would tend to make the rates for the early years too low and thus prevent the cities from showing a decrease.

In rating cities as to their relative healthfulness it would hardly be fair to arrange them according to the percentage of decrease in their death rates, for a city with a low rate to start with would not have a possibility of reducing it equal to that of the city which started with a high rate. Moreover, as we are especially interested in the conditions obtaining at the present time, the average rates for the entire period and for the first three years are not satisfactory for rating purposes. We, therefore, will take the average rates for the years 1912–1914 as the basis in comparing the cities. We assume that the lower this rate, the more healthful is the city. The order of the cities in regard to their healthfulness, beginning with the one having the lowest rate, would then be as follows:

| | | | |
|---|---|---|---|
| (1) Minneapolis | 11.3 | (8) Buffalo | 15.4 |
| (2) Omaha | 13.4 | (9) San Francisco | 15.6 |
| (3) Cleveland | 13.6 | (10) Pittsburgh | 16.2 |
| (4) Denver | 13.7 | (11) Boston | 16.3 |
| (5) New York | 14.2 | (12) Cincinnati | 16.5 |
| (6) Los Angeles | 14.2 | (13) Baltimore | 18.0 |
| (7) St. Louis | 15.0 | (14) New Orleans | 20.2 |

*Standardized Death Rates.* As has already been indicated, the crude death rate is markedly influenced by the age and sex distribution of the population. Since in the standardized death rates the variable factors of age and sex distribution have been eliminated, they should furnish a more reliable index of sanitary conditions in comparing communities than the crude death rates. The standardized rates presented in this paper were computed by the indirect method as described in the Seventy-fourth Annual Report of the Registrar General of Births, Deaths, and Marriages in England and Wales, 1911.

TABLE II.
STANDARDIZED DEATH RATES.

| City. | Average Rate, 1900–1914. | Average Rate, 1900–1902. | Average Rate, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore................. | 20.6 | 21.8 | 19.2 | −2.6 |
| Boston.................... | 19.1 | 21.0 | 17.4 | −3.6 |
| Buffalo................... | 17.1 | 16.4 | 17.0 | +0.6 |
| Cincinnati................ | 20.3 | 20.2 | 17.9 | −2.3 |
| Cleveland................. | 16.2 | 17.9 | 15.2 | −2.7 |
| Denver.................... | 18.8 | 21.0 | 15.6 | −5.4 |
| Los Angeles............... | 16.3 | 17.9 | 15.0 | −2.9 |
| Minneapolis............... | 12.5 | 12.7 | 13.1 | +0.4 |
| New Orleans............... | 24.3 | 26.1 | 22.4 | −3.7 |
| New York................. | 19.7 | 22.5 | 16.3 | −6.2 |
| Omaha.................... | 14.9 | 13.9 | 15.5 | +1.6 |
| Pittsburgh................ | 20.7 | 22.5 | 18.3 | −4.2 |
| San Francisco............. | 20.1 | 23.5 | 17.7 | −5.8 |
| St. Louis................. | 18.4 | 20.1 | 17.0 | −3.1 |

On the basis of the standardized rates for the period of 1912–1914, the cities now have the following order:

| | | | |
|---|---|---|---|
| (1) Minneapolis.......... | 13.1 | (8) Buffalo.............. | 17.0 |
| (2) Los Angeles.......... | 15.0 | (9) Boston.............. | 17.4 |
| (3) Cleveland............ | 15.2 | (10) San Francisco........ | 17.7 |
| (4) Omaha.............. | 15.5 | (11) Cincinnati........... | 17.9 |
| (5) Denver.............. | 15.6 | (12) Pittsburgh........... | 18.3 |
| (6) New York............ | 16.3 | (13) Baltimore............ | 19.2 |
| (7) St. Louis............. | 17.0 | (14) New Orleans......... | 22.4 |

It will be noticed that the order of the cities is not the same as in the previous rating based upon the crude death rates. Minneapolis and Cleveland retain the first and the third place respectively. Omaha has dropped from the second to the fourth place, and Los Angeles jumped from the fifth to the second.

*Infant Mortality.* The number of children dying under one year of age is frequently used as an index of the health of a community. This is not a complex index, because it measures only a few of the factors or conditions which require consideration, and the same can be said of all the other indices which will be taken up in this paper. Still the attitude taken by a community toward the health and care of infants indicates in a certain way the general attitude toward all health activities. A study, therefore, of the infant mortality, should give some indication, even if in a general way, of the healthfulness of a given place. A serious difficulty,

however, is experienced in calculating a rate for expressing
the infant mortality which will be reliable for purposes of
comparison. It is fairly well agreed that the infant mortality
should be expressed as so many deaths per 1,000 living births.
But as the registration of births in the United States is noto-
riously defective, any rates based upon this registration will of
course be inaccurate and not of much service. Then, too,
it would not be fair to compare, on this basis, cities which
have complete registration of births with those which have not.
Since some of the cities studied do not have complete regis-
tration of births, unless perhaps for the most recent years,
this method of expressing the infant mortality could not be
used.

Several other methods were tried. The infant mortality
was expressed in the following ways: (1) per 1,000 of living
population under one year of age; (2) per 1,000 of living popu-
lation under 5 years of age; (3) as a percentage of the total
number of deaths; and (4) per 100,000 total population. It
is obvious that all these are likely to be unsatisfactory. In
the first two methods, the populations used in calculating
the rates except for censal years must be estimated and these
estimates are very likely to be inaccurate. Then, too, even
in census years, the actual enumeration of persons in the age
group under one is not considered to be very accurate.
As the enumeration of persons in the age group 1–5 is likely
to be more accurate, the second method was tried, but it did
not prove to be of much value. The third method is even
worse than the other two, for it is a ratio between two variable
factors and so does not give any reliable picture of the infant
mortality. If, for instance, the deaths from causes other
than infant mortality decreased and the deaths of infants
remained the same, the percentage obtained would indicate
that infant mortality had increased, while in reality it would
have remained the same. The fourth method is influenced
by variations in the composition of the population and,
therefore, is not entirely reliable.

The infant mortality was calculated, however, by all these
methods to see what information could be gained. The accu-
racy of these methods was then tested by comparing the

results obtained by expressing the infant mortality as so many deaths per 1,000 living births. It is assumed, of course, that this latter method is the most accurate, and so should be used as a standard. The Bureau of the Census, in Bulletin 112, 1911, indicated that 8 of the cities, Los Angeles, St. Louis, New York, Boston, Omaha, Cincinnati, Pittsburgh, and Buffalo, are considered to have fairly complete registration of births, so that a rate of infant mortality based on births would be approximately correct for these cities. Such a rate was taken for a given year and these cities arranged according to the magnitude of their infant mortality, beginning with the city having the lowest. The cities were then similarly arranged for the same year by using rates calculated by each of the 4 other methods. None of the 4 methods placed the cities in the same relative position as regards their infant mortality as that in which they were placed by the standard method. The following table may help to make these points clearer:

TABLE III.

INFANT MORTALITY RATES, 1910.

| City. | Infant Deaths per 1,000 Births. | Rank. | Infant Deaths per 1,000 Population under 5. | Rank. | Infant Deaths per 100,000 Total Population | Rank. | Infant Deaths per 1,000 Population under 1. | Rank. | Per Cent. of Infant Deaths to Total Deaths. | Rank. |
|---|---|---|---|---|---|---|---|---|---|---|
| Los Angeles..... | 97 | 1 | 22.9 | 1 | 164 | 1 | 110 | 1 | 11.7 | 1 |
| St. Louis....... | 115 | 2 | 28.0 | 2 | 244 | 3 | 136 | 2 | 15.6 | 3 |
| New York...... | 125 | 3 | 31.8 | 5 | 337 | 6 | 147 | 4 | 21.1 | 6 |
| Boston......... | 126 | 4 | 35.1 | 6 | 333 | 5 | 167 | 6 | 19.5 | 5 |
| Omaha......... | 126 | 5 | 28.2 | 3 | 237 | 2 | 140 | 3 | 15.7 | 4 |
| Cincinnati...... | 131 | 6 | 31.4 | 4 | 252 | 4 | 150 | 5 | 14.5 | 2 |
| Pittsburgh...... | 150 | 7 | 38.9 | 8 | 421 | 8 | 176 | 7 | 23.4 | 7 |
| Buffalo......... | 162 | 8 | 38.2 | 7 | 382 | 7 | 180 | 8 | 23.4 | 8 |

It will be seen that the methods of expressing the infant mortality other than by the relation of infant deaths to births are not satisfactory for purpose of comparison between places. In view of this the rates as calculated by the 4 other methods will not be used in this paper. It should be added, however, that the calculation showed, for practically every city, by each of the 4 methods, that the infant mortality has decreased, and in some cases to a large extent, during the period 1900–1914.

*Typhoid Fever.* The death rate from typhoid fever is generally thought to be a good sanitary index of a community. It is a valuable index because it is a disease which can and should be controlled, for the principles underlying its eradication are fairly well understood and are possible of application. The data regarding typhoid fever are presented in the following table:

TABLE IV.

TYPHOID FEVER DEATH RATES PER 100,000 POPULATION.

| City. | Average Rates, 1900-1914. | Average Rates, 1900-1902. | Average Rates, 1912-1914. | Decrease. |
|---|---|---|---|---|
| Baltimore | 32.4 | 36.6 | 23.5 | −13.1 |
| Boston | 16.7 | 23.6 | 8.4 | −15.2 |
| Buffalo | 23.5 | 28.3 | 14.3 | −14.0 |
| Cincinnati | 33.0 | 51.8 | 6.4 | −45.4 |
| Cleveland | 28.1 | 41.9 | 9.8 | −32.1 |
| Denver | 34.0 | 47.2 | 12.2 | −35.0 |
| Los Angeles | 22.8 | 33.9 | 11.6 | −22.3 |
| Minneapolis | 29.2 | 42.3 | 12.1 | −30.2 |
| New Orleans | 34.4 | 48.9 | 17.5 | −31.4 |
| New York | 14.2 | 20.4 | 7.6 | −12.8 |
| Omaha | 24.8 | 23.3 | 9.0 | −14.3 |
| Pittsburgh | 81.3 | 132.0 | 15.9 | −116.1 |
| San Francisco | 23.8 | 28.1 | 14.4 | −13.7 |
| St. Louis | 23.8 | 35.4 | 12.9 | −22.5 |

Table IV plainly shows that for all the cities there has been a marked decrease in the amount of typhoid fever. Still the rates are much too high. Arranging the cities according to their typhoid rates for the period 1912–1914, we obtain the following relative standing:

|   |   |   |   |
|---|---|---|---|
| (1) Cincinnati | 6.4 | (8) Denver | 12.2 |
| (2) New York | 7.6 | (9) St. Louis | 12.9 |
| (3) Boston | 8.4 | (10) Buffalo | 14.3 |
| (4) Omaha | 9.0 | (11) San Francisco | 14.4 |
| (5) Cleveland | 9.8 | (12) Pittsburgh | 15.9 |
| (6) Los Angeles | 11.6 | (13) New Orleans | 17.5 |
| (7) Minneapolis | 12.1 | (14) Baltimore | 23.5 |

By this method of rating cities we should judge that Cincinnati was the most healthful, with New York second and Boston third. None of these cities, however, was in any of the first three positions when the rating was based upon the standardized death rates.

*Tuberculosis.* The death rate from tuberculosis is also a frequently used and valuable index in judging the sanitary

conditions of different places. The nature of the disease is fairly well understood. There are also certain procedures which are generally admitted to be efficacious in preventing the disease, and there are many organizations engaged in the work of prevention. The death rate from tuberculosis, therefore, is a valuable index of what a community is accomplishing along at least one line of health work as well as of its general healthfulness.

Only the pulmonary form of tuberculosis is considered, for this is the most common type of the disease and the one against which most of the preventive measures are directed. Pulmonary tuberculosis is also representative of the whole tuberculosis problem.

TABLE V.

PULMONARY TUBERCULOSIS DEATH RATES PER 100,000 POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore | 223 | 232 | 191 | − 41 |
| Boston | 185 | 232 | 146 | − 86 |
| Buffalo | 125 | 119 | 130 | + 11 |
| Cincinnati | 235 | 214 | 220 | + 6 |
| Cleveland | 120 | 116 | 113 | − 3 |
| Denver | 334 | 375 | 246 | −129 |
| Los Angeles | 275 | 328 | 227 | −101 |
| Minneapolis | 113 | 118 | 115 | − 3 |
| New Orleans | 282 | 323 | 249 | − 74 |
| New York | 199 | 226 | 169 | − 57 |
| Omaha | 101 | 97 | 93 | − 4 |
| Pittsburgh | 120 | 128 | 101 | − 27 |
| San Francisco | 214 | 284 | 166 | −118 |
| St. Louis | 175 | 187 | 136 | − 51 |

In studying this table it must be remembered that in some instances the registration of deaths was incomplete for the period 1900–1902, and so the rates are too low. This tends to make the apparent decrease in the rates too small and may even account for an increase. A possible underestimate of the populations for 1912–1914 would have a similar effect upon the amount of decrease or increase. In general the rates have shown a tendency to decrease for most of the cities, and they probably have actually decreased in every instance. The cities have the following relative standing when arranged according to their pulmonary tuberculosis rates for the period 1912–1914:

| | | | |
|---|---|---|---|
| (1) Omaha................ | 93 | (8) San Francisco.......... | 166 |
| (2) Pittsburgh............ | 101 | (9) New York............. | 169 |
| (3) Cleveland............. | 113 | (10) Baltimore............. | 191 |
| (4) Minneapolis........... | 115 | (11) Cincinnati............ | 220 |
| (5) Buffalo............... | 130 | (12) Los Angeles........... | 227 |
| (6) St. Louis.............. | 136 | (13) Denver............... | 246 |
| (7) Boston................ | 146 | (14) New Orleans.......... | 249 |

It will be observed that the positions of the cities have again changed to a marked extent, and do not correspond with any of the previous ratings.

*Death Rates for the Age Group 1–4.* There are various agencies engaged in the prevention of infant mortality. When a child goes to school its health is again cared for by the various health activities of the school organization. There is the possibility, however, that the health of children in the age group 1–4 is not sufficiently cared for, as there seems to be a gap here in the health activities for such children. Thus the death rates for this group age may serve as a valuable index of the inherent healthfulness of a given place. In any event it measures one of the factors which go to make up the healthfulness of a community.

TABLE VI.

DEATH RATES PER 100,000 POPULATION, IN AGE GROUP 1–4.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Decrease. |
|---|---|---|---|---|
| Baltimore.................... | 156 | 185 | 122 | — 63 |
| Boston...................... | 153 | 213 | 111 | —102 |
| Buffalo..................... | 128 | 152 | 96 | — 56 |
| Cincinnati................... | 123 | 161 | 81 | — 80 |
| Cleveland................... | 129 | 155 | 114 | — 41 |
| Denver..................... | 84 | 117 | 52 | — 65 |
| Los Angeles................. | 73 | 83 | 65 | — 18 |
| Minneapolis................. | 73 | 93 | 64 | — 29 |
| New Orleans................. | 136 | 174 | 104 | — 74 |
| New York................... | 190 | 251 | 128 | —123 |
| Omaha...................... | 71 | 95 | 57 | — 38 |
| Pittsburgh................... | 219 | 265 | 168 | — 97 |
| San Francisco................ | 84 | 112 | 70 | — 42 |
| St. Louis.................... | 119 | 183 | 93 | — 90 |

The question arose as to whether the rates should be expressed as so many deaths per 100,000 total population or per 1,000 under 5 years of age. The first method seemed preferable for the reasons previously noted. It must be remembered, however, that the age distribution of the population exerts

some influence on the rates when this method is followed, but the error from this cause is probably slight.

Table VI shows that for all the cities there has been a decrease in the death rates for the age group 1–4. Rating the cities according to this index, we obtain the following result:

(1) Denver . . . . . . . . . . . . . . .    52     (8) Buffalo . . . . . . . . . . . . . . .    96
(2) Omaha . . . . . . . . . . . . . . .    57     (9) New Orleans . . . . . . . . . . .    104
(3) Minneapolis . . . . . . . . . . .    64     (10) Boston . . . . . . . . . . . . . .    111
(4) Los Angeles . . . . . . . . . . .    65     (11) Cleveland . . . . . . . . . . . .    114
(5) San Francisco . . . . . . . . . .    70     (12) Baltimore . . . . . . . . . . . .    122
(6) Cincinnati . . . . . . . . . . . .    81     (13) New York . . . . . . . . . . . .    128
(7) St. Louis . . . . . . . . . . . . .    93     (14) Pittsburgh . . . . . . . . . . .    168

The relative positions of the cities are quite different from those shown in any of the other ratings.

*Diarrhoea (Under 2).* The death rate from diarrhoea under 2 years is frequently considered to be a good index of the sanitary conditions of a community, because it measures the care given children. The rates will be expressed as so many deaths per 100,000 total population. The following table presents the data relating to diarrhoea under two years of age:

TABLE VII.

DIARRHOEA (UNDER TWO) DEATH RATES PER 100,000 POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore . . . . . . . . . . . . . . . . . . | 119 | 143 | 95 | −48 |
| Boston . . . . . . . . . . . . . . . . . . . | 100 | 119 | 74 | −45 |
| Buffalo . . . . . . . . . . . . . . . . . . . | 125 | 114 | 125 | +11 |
| Cincinnati . . . . . . . . . . . . . . . . . | 76 | 72 | 62 | −10 |
| Cleveland . . . . . . . . . . . . . . . . . | 120 | 95 | 131 | +36 |
| Denver . . . . . . . . . . . . . . . . . . . | 44 | 51 | 21 | −30 |
| Los Angeles . . . . . . . . . . . . . . . | 35 | 35 | 33 | − 2 |
| Minneapolis . . . . . . . . . . . . . . . | 47 | 51 | 36 | −15 |
| New Orleans . . . . . . . . . . . . . . . | 117 | 111 | 90 | −21 |
| New York . . . . . . . . . . . . . . . . . | 125 | 156 | 72 | −84 |
| Omaha . . . . . . . . . . . . . . . . . . . | 45 | 48 | 25 | −23 |
| Pittsburgh . . . . . . . . . . . . . . . . . | 158 | 171 | 118 | −53 |
| San Francisco . . . . . . . . . . . . . . | 48 | 57 | 36 | −21 |
| St. Louis . . . . . . . . . . . . . . . . . . | 68 | 59 | 63 | + 4 |

This method places the cities in the following relative positions:

(1) Denver . . . . . . . . . . . . . . .    21     (3) Los Angeles . . . . . . . . . . .    33
(2) Omaha . . . . . . . . . . . . . . .    25     (4) San Francisco . . . . . . . . . .    36

| | | | |
|---|---|---|---|
| (5) Minneapolis.......... | 36 | (10) New Orleans.......... | 90 |
| (6) Cincinnati........... | 62 | (11) Baltimore........... | 95 |
| (7) St. Louis............ | 63 | (12) Pittsburgh.......... | 118 |
| (8) New York........... | 72 | (13) Buffalo............. | 125 |
| (9) Boston.............. | 74 | (14) Cleveland........... | 135 |

It will be noted that this rating is quite different from that for typhoid fever. From this it is probably fair to presume that the conditions affecting the prevalence of typhoid fever are not the same as those for diarrhoea.

The diseases which remain to be considered belong in a somewhat different class from those already covered. There are certain methods which are well understood and which are generally admitted by all to be efficacious in preventing typhoid fever and tuberculosis. There seems, however, to be no unanimity in regard to the best methods for restricting or eliminating the following diseases, with the possible exception of diphtheria, and the methods which are used do not give especially satisfactory results.

TABLE VIII.
MEASLES DEATH RATES PER 100,000 TOTAL POPULATION

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore................... | 8.0 | 5.4 | 7.6 | + 2.2 |
| Boston...................... | 15.0 | 17.2 | 11.6 | − 5.6 |
| Buffalo..................... | 12.5 | 13.1 | 11.7 | − 1.4 |
| Cincinnati.................. | 11.6 | 12.2 | 8.5 | − 3.7 |
| Cleveland................... | 8.2 | 3.6 | 8.7 | + 5.1 |
| Denver..................... | 7.7 | 8.8 | 1.2 | − 7.6 |
| Los Angeles................. | 5.2 | 3.8 | 4.9 | + 1.1 |
| Minneapolis................. | 5.0 | 1.6 | 3.9 | + 2.3 |
| New Orleans................. | 6.8 | 7.3 | 4.3 | − 3.0 |
| New York................... | 15.7 | 16.2 | 12.2 | − 4.0 |
| Omaha...................... | 5.7 | 5.0 | .2 | − 4.8 |
| Pittsburgh.................. | 25.5 | 32.6 | 21.2 | −11.4 |
| San Francisco............... | 8.2 | 9.9 | 7.6 | − 2.3 |
| St. Louis................... | 9.3 | 2.5 | 9.3 | + 6.8 |

Table VIII shows that deaths from measles are a very variable factor in judging the health conditions of a place. In some instances the rates have increased during the last 15 years, and in others they have decreased. A study of the measles rates gives the following relative positions to the cities:

(1) Omaha.............. .2      (8) Cincinnati........... 8.5
(2) Denver............. 1.2     (9) Cleveland........... 8.7
(3) Minneapolis........ 3.9     (10) St. Louis.......... 9.3
(4) New Orleans........ 4.3     (11) Boston............ 11.6
(5) Los Angeles........ 4.9     (12) Buffalo........... 11.7
(6) Baltimore......... 7.6      (13) New York.......... 12.2
(7) San Francisco...... 7.6     (14) Pittsburgh........ 21.2

In a general way the higher rates are associated with the larger cities and the lower rates with the smaller cities, thus seeming to imply a relation between the density of population and the prevalence of measles.

TABLE IX.

SCARLET FEVER DEATH RATES PER 100,000 TOTAL POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore................... | 8.4 | 4.4 | 5.6 | + 1.2 |
| Boston..................... | 14.2 | 30.5 | 8.0 | −22.5 |
| Buffalo.................... | 13.7 | 7.7 | 4.8 | − 2.9 |
| Cincinnati................. | 9.2 | 11.3 | 6.7 | − 4.6 |
| Cleveland.................. | 12.6 | 9.9 | 14.7 | + 4.8 |
| Denver.................... | 19.3 | 29.4 | 13.2 | −16.2 |
| Los Angeles............... | 4.4 | 6.6 | 2.1 | − 4.5 |
| Minneapolis............... | 10.3 | 9.7 | 16.5 | + 6.8 |
| New Orleans............... | 5.5 | 10.8 | 1.2 | − 9.6 |
| New York................. | 18.3 | 24.3 | 10.2 | −14.1 |
| Omaha.................... | 8.6 | 10.8 | 8.1 | − 2.7 |
| Pittsburgh................. | 20.8 | 25.1 | 23.2 | − 1.9 |
| San Francisco.............. | 2.9 | 4.0 | 1.6 | − 2.4 |
| St. Louis.................. | 12.2 | 14.1 | 9.9 | − 4.2 |

Table IX indicates that for most of the cities there has been a slight decrease in the death rates from scarlet fever. This would presumably indicate that there had been a decrease in the amount of scarlet fever. This, however, is not necessarily so, for the mortality from this disease varies in different epidemics and from year to year. The same is true of the other diseases in the group now being studied. It might appear to be better to use the number of cases of each disease in forming a judgment about the healthfulness of a place, but the fact that the number of cases which are reported for a disease is not nearly so complete as the number of deaths registered for the same disease is a serious objection to the use of this method. It may be noted in passing that while this paper is primarily concerned with judging healthfulness by a study of death rates, the author realizes that there may be other methods of attaining the same result.

A study of the scarlet fever rates places the cities in the following relative positions:

| | | | | |
|---|---|---|---|---|
| (1) New Orleans | 1.2 | (8) Omaha | 8.1 |
| (2) San Francisco | 1.6 | (9) St. Louis | 9.9 |
| (3) Los Angeles | 2.1 | (10) New York | 10.2 |
| (4) Buffalo | 4.8 | (11) Denver | 13.2 |
| (5) Baltimore | 5.6 | (12) Cleveland | 14.7 |
| (6) Cincinnati | 6.7 | (13) Minneapolis | 16.5 |
| (7) Boston | 8.0 | (14) Pittsburgh | 23.2 |

It will be noticed that this rating is entirely different from that which obtains with measles.

TABLE X.

WHOOPING COUGH DEATH RATES PER 100,000 TOTAL POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore | 12.4 | 13.5 | 10.1 | − 3.4 |
| Boston | 14.5 | 18.0 | 10.1 | − 7.9 |
| Buffalo | 10.5 | 10.7 | 9.7 | − 1.0 |
| Cincinnati | 7.4 | 6.0 | 10.5 | + 4.5 |
| Cleveland | 7.9 | 5.8 | 7.6 | + 1.8 |
| Denver | 8.0 | 7.0 | 5.7 | − 1.3 |
| Los Angeles | 6.6 | 9.3 | 6.1 | − 3.2 |
| Minneapolis | 7.3 | 7.6 | 7.0 | − 0.6 |
| New Orleans | 7.5 | 5.1 | 3.4 | − 1.7 |
| New York | 8.0 | 12.2 | 6.2 | − 6.0 |
| Omaha | 10.0 | 12.0 | 5.8 | − 6.2 |
| Pittsburgh | 21.6 | 25.1 | 12.2 | −12.9 |
| San Francisco | 9.8 | 8.1 | 7.3 | − 0.8 |
| St. Louis | 7.4 | 6.5 | 7.4 | + 0.9 |

In most instances it will be seen that there has been a decrease in the death rates from whooping cough. The following is the list of cities arranged as to their average death rates from whooping cough for the period 1912–1914:

| | | | | |
|---|---|---|---|---|
| (1) New Orleans | 3.4 | (8) St. Louis | 7.4 |
| (2) Denver | 5.7 | (9) Cleveland | 7.6 |
| (3) Omaha | 5.8 | (10) Buffalo | 9.7 |
| (4) Los Angeles | 6.1 | (11) Baltimore | 10.1 |
| (5) New York | 6.2 | (12) Boston | 10.1 |
| (6) Minneapolis | 7.0 | (13) Cincinnati | 10.5 |
| (7) San Francisco | 7.3 | (14) Pittsburgh | 12.2 |

The relative positions of the cities in this list are somewhat similar to those in the list based upon the measles death rates.

TABLE XI.

DIPHTHERIA DEATH RATES PER 100,000 TOTAL POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore | 20.9 | 38.3 | 15.2 | −23.1 |
| Boston | 34.0 | 63.6 | 20.0 | −43.6 |
| Buffalo | 24.0 | 32.0 | 12.9 | −19.1 |
| Cincinnati | 17.3 | 24.2 | 15.6 | − 8.6 |
| Cleveland | 31.2 | 50.4 | 29.9 | −20.5 |
| Denver | 21.3 | 33.4 | 4.8 | −28.6 |
| Los Angeles | 16.7 | 26.7 | 7.5 | −19.2 |
| Minneapolis | 33.2 | 61.0 | 24.3 | −36.7 |
| New Orleans | 15.2 | 14.3 | 26.4 | +12.1 |
| New York | 41.1 | 58.9 | 25.3 | −33.6 |
| Omaha | 17.8 | 17.9 | 23.0 | + 5.1 |
| Pittsburgh | 34.3 | 46.6 | 32.1 | −14.5 |
| San Francisco | 19.9 | 42.4 | 10.6 | −31.8 |
| St. Louis | 28.4 | 47.9 | 27.8 | −20.1 |

In all but two cases it will be seen that there has been a decline in the diphtheria death rates. This decrease has probably been in large measure due to the increased use of diphtheria antitoxin. By arranging the cities according to their diphtheria rates, the following result is obtained:

(1) Denver ............... 4.8      (8) Omaha ............... 23.0

(2) Los Angeles .......... 7.5      (9) Minneapolis .......... 24.3

(3) San Francisco ........ 10.6     (10) New York .......... 25.3

(4) Buffalo .............. 12.9     (11) New Orleans ........ 26.4

(5) Baltimore ............ 15.2     (12) St. Louis ........... 27.8

(6) Cincinnati ........... 15.6     (13) Cleveland .......... 29.9

(7) Boston ............... 20.0     (14) Pittsburgh .......... 32.1

This relative position of the cities somewhat resembles that obtained from the scarlet fever rates.

TABLE XII.

PNEUMONIA DEATH RATES PER 100,000 TOTAL POPULATION.

| City. | Average Rates, 1900–1914. | Average Rates, 1900–1902. | Average Rates, 1912–1914. | Increase or Decrease. |
|---|---|---|---|---|
| Baltimore | 196 | 207 | 194 | −13 |
| Boston | 196 | 198 | 198 | 0 |
| Buffalo | 143 | 136 | 140 | + 4 |
| Cincinnati | 158 | 161 | 149 | −12 |
| Cleveland | 133 | 166 | 114 | −52 |
| Denver | 161 | 200 | 116 | −84 |
| Los Angeles | 110 | 143 | 93 | −50 |
| Minneapolis | 102 | 96 | 107 | +11 |
| New Orleans | 170 | 185 | 156 | −29 |
| New York | 237 | 276 | 190 | −86 |
| Omaha | 122 | 122 | 131 | + 9 |
| Pittsburgh | 253 | 250 | 261 | +11 |
| San Francisco | 154 | 181 | 131 | −50 |
| St. Louis | 156 | 178 | 164 | −14 |

Table XII plainly shows that in a general way the rates from pneumonia are slightly decreasing. The rates, however, clearly indicate that there is still much to be done in reducing the prevalence of this disease. The problem demands more attention from health authorities.

The pneumonia death rates give the following relative position to the cities:

| | | | | |
|---|---|---|---|---|
| (1) | Los Angeles | 93 | (8) Cincinnati | 149 |
| (2) | Minneapolis | 107 | (9) New Orleans | 156 |
| (3) | Cleveland | 114 | (10) St. Louis | 164 |
| (4) | Denver | 116 | (11) New York | 190 |
| (5) | Omaha | 131 | (12) Baltimore | 194 |
| (6) | San Francisco | 131 | (13) Boston | 198 |
| (7) | Buffalo | 140 | (14) Pittsburgh | 261 |

It will be readily observed that this rating is somewhat different from those obtaining for the other infectious diseases of the group being studied.

The results obtained by using the various methods are evidently not altogether comparable. That is, the cities do not consistently retain the same relative positions in the ratings. If a city is judged by one method it may hold first position; if judged by another method it may be third or fourth. All this goes to prove that any index based upon only one of the factors making up the health of a community is not an entirely satisfactory and just measure of its health-fulness.

The following table is presented to summarize the main points brought out in this paper. It brings together the relative positions obtained by each city from all the various rates studied. In addition, for purposes of comparison the relative position of each city is shown when an average of all its rates is taken as a basis for the grading.

TABLE XIII.

RELATIVE POSITIONS OF THE CITIES AS OBTAINED FROM VARIOUS DEATH RATES
PREVIOUSLY PRESENTED.

| City. | Typhoid. | Tuberculosis. | Age Group (1-4). | Diarrhoea (Under 2). | Measles. | Scarlet Fever. | Whooping Cough. | Diphtheria. | Pneumonia. | Total Average Rating. | Standardized Death Rates. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Baltimore.... | 14 | 10 | 12 | 11 | 6 | 5 | 11 | 5 | 12 | 13 | 13 |
| Boston...... | 3 | 7 | 10 | 9 | 11 | 7 | 12 | 7 | 13 | 10 | 9 |
| Buffalo...... | 10 | 5 | 8 | 13 | 12 | 4 | 10 | 4 | 7 | 8 | 8 |
| Cincinnati ... | 1 | 11 | 6 | 6 | 8 | 6 | 13 | 6 | 8 | 9 | 11 |
| Cleveland.... | 5 | 3 | 11 | 14 | 9 | 12 | 9 | 13 | 3 | 7 | 3 |
| Denver...... | 8 | 13 | 1 | 1 | 2 | 11 | 2 | 1 | 4 | 5 | 5 |
| Los Angeles.. | 6 | 12 | 4 | 3 | 5 | 3 | 4 | 2 | 1 | 4 | 2 |
| Minneapolis.. | 7 | 4 | 3 | 5 | 3 | 13 | 6 | 9 | 2 | 2 | 1 |
| New Orleans . | 13 | 14 | 9 | 10 | 4 | 1 | 1 | 11 | 9 | 12 | 14 |
| New York ... | 2 | 9 | 13 | 8 | 13 | 10 | 5 | 10 | 11 | 11 | 6 |
| Omaha...... | 4 | 1 | 2 | 2 | 1 | 8 | 3 | 8 | 5 | 1 | 4 |
| Pittsburgh... | 12 | 2 | 14 | 12 | ·14 | 14 | 14 | 14 | 14 | 14 | 12 |
| San Francisco | 11 | 8 | 5 | 4 | 7 | 2 | 7 | 3 | 6 | 3 | 10 |
| St. Louis.... | 9 | 6 | 7 | 7 | 10 | 9 | 8 | 12 | 10 | 6 | 7 |

If Table XIII is read from left to right, some very interesting information is obtained. It shows the good and the weak points in the healthfulness of each city. It shows very plainly that the health of a city may be very good when viewed from one angle, but very poor when viewed from another. Take the following instances: When typhoid fever and tuberculosis are considered, Cincinnati holds the first and the eleventh positions respectively. Pittsburgh, as a rule, has a poor rating, but that from tuberculosis is very good. In the same way New Orleans, which generally has a poor rating, stands very well when scarlet fever and whooping cough are considered.

Table XIII indicates in a way the line of health work which should be most energetically undertaken by each city. A city with a poor rating from typhoid fever needs to devote more attention and more work to the problem of eradicating this disease than to diseases which give it a good standing.

The tables also furnish a basis on which to select a living place. A person with young children would not select Cleveland as a place in which to live because of the poor standing which this city has in the matter of diarrhoea of early childhood. In the same manner, anyone who wished to escape tuberculosis would not select New Orleans, and so on.

By comparing the average ratings and those based upon

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the standardized death rates, a general idea can be obtained of the relative ranking of the cities considered from all points of view.

In conclusion it seems reasonable to make the following deductions:

1. The use of a life table furnishes the best single means of comparing communities in regard to their health.

2. The use of standardized death rates constitutes the next best method, and it is much to be preferred to the use of the crude death rates.

3. The infant mortality rate is not a satisfactory index of the health of the community, because in most instances there is no accurate method of expressing it.

4. The death rates from the various infectious diseases do not give comparable results. The death rate from a single disease apparently does not give a just and fair representation of the healthfulness of a city. In judging the healthfulness of a city, such rates should therefore be used with care and discretion.